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# USSR Report

ENERGY

(FOUO 18/81)



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USSR REPORT

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ELECTRIC POWER

DEPUTY POWER MINISTER OUTLINES WINTER PREPARATION WORK

Moscow ELEKTRICHESKIYE STANTSII in Russian No 8, Aug 81 pp 2-5

/Article by Ye. I. Borisov, first deputy minister of Power and Electrification, USSR: "Implementing the Decisions of the 26th Party Congress: Preparing the Power Systems for Operation in Winter Conditions - A Crucial State Task"7

[Excerpts] In the electric power sector, just as throughout the Soviet Union, the all-union socialist competition to successfully fulfill and overfulfill the assignments of the 11th Five-Year Plan and to ensure the implementation of the historical decisions of the 26th Party Congress and the suggestions and instructions that were outlined in L. I. Brezhnev's report to the Party Congress has gotten underway.

The power workers have much to do in order to prepare the power equipment of electric power stations, the electric and thermal systems, the fuel and transport services of the electric power stations, and the auxiliary services for the winter. They also must solve important tasks regarding the creation of fuel reserves and the timely implementation of power capacities. No less important tasks are to be encountered in ensuring the conservation of fuel and electric and thermal power both for the power systems and the consumers and in preparing personnel for work in complex winter conditions. These and other basic questions, connected with preparations for winter, are outlined in detail in several orders of the USSR Ministry of Power and Electrification (Minenergo).

Organizing the steady power supply for consumers requires that significant steps be taken, that there be increased responsibility and that things be well organized. It also requires the strictest discipline in all sectors and in all links of the power system both during the actual preparations for winter and during the period of the maximum load.

In 1980 the power workers did a good job and the national economy's power supply was provided.

Throughout the Soviet Union 13.3 million kilowatts of new electric power capacities were put into operation. Several key high voltage power transmission lines (500 - 750 KV) were built. The rated capacity

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of Soviet electric power stations reached 267 million kilowatts and the length of high voltage power transmission lines of all voltages was nearly five million kilometers. The unified power system today embraces 90 percent of all rated electric power station capacity and 95 percent of the electric power produced.

In 1980 the production of electric power reached 1,295 billion kilowatt-hours.

The work that has been done has made it possible to more fully meet the needs of consumers for electric power, to completely hand over the capacities of the Chernobyl', Leningrad, Ekibastuz electric power stations, and to significantly increase the throughput capacity of the inter-system ties.

In 1980 the operational personnel of the electric power stations and power systems took many steps to solve the important state task of further reducing the relative outlays of fuel for the production of energy. For this indicator the assignments of the Basic Directions for the 10th Five-Year Plan, which were approved by the 25th Party Congress, were fulfilled - the relative outlay reached 328 grams per kilowatt-hour.

The operation of the atomic electric power stations (AES) improved significantly. The utilization factor of the rated capacity of the Kursk AES was 79.1 percent, the Chernobyl' AES - 80.9 percent, the Kol'skaya AES - 93.5 percent. In the majority of the electric power systems the accident rate fell. On the whole for the ministry the total number of accidents decreased in 1980 as compared with 1979.

An analysis of the sector's work during the fall and winter maximum load once again demonstrated the advantages of the parallel operation of the power systems in supplying the more rational use of fuel and energy resources and the effective maneuverability of rated power capacities. The collectives of the majority of the power systems and electric power stations displayed a high degree of responsibility and discipline in carrying out the effective orders for providing the assigned modes of operation; this significantly simplified the transmission of the elapsed maximum load.

At the same time several electric power systems and stations had significant shortcomings in their work in the complicated winter situation. They failed to ensure the full utilization of rated capacities and did not work closely enough with consumers to regulate the consumption of electricity during the maximum load hours. And they did not adhere to equipment maintenance schedules.

Some electric power administrations failed to realize their fuel funds, which led to the under utilization of the power capacities of several electric power stations.

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Some electric power stations were not adequately prepared for operation during the winter. This includes the Yermakovskaya and Gusino-ozerskaya GRESs, the Nizhnekamskaya TETs-2, the Dzhezkazganskaya TETs and the Lipetskaya TETs-2.

Some power systems and construction and installation subdivisions did not take timely measures to ensure the reliable operation of newly introduced power units. This was evident at the Engel'skaya TETs-3, the Petrozavodskaya TETs, the Mazheyskaya TETs, and the Tselinogradskaya TETs-2.

Tatenergo, Kuybyshevenergo, Bashkirenergo, Tyumen'energo, Novosibirsk-energo, Tomskenergo, Komienergo and the Kazakh SSR Minenergo failed to fulfill assignments for eliminating disruptions in power capacities and to ensure the full output of capacity.

We must recall that last winter was warm and the conditions for transmitting the maximum load were not as difficult. The forthcoming fall and winter season maximum load will be more difficult and all power systems must prepare for it. The collectives of the power systems of the Center, Central Volga, the South, Urals and Siberia, where the higher mobilization of reserves will be required, have an especially large amount of work to do.

This year it will be necessary to complete all basic repair work by no later than October; by this time all power enterprises must be ready to operate at full capacity. This means that the preparation of the electric power stations and the electric and thermal networks by winter must be carried out within more compressed time periods and that this is a crucial obligation of managers at all levels.

First of all a maintenance campaign must be conducted on a timely basis and a quality basis. This year some 673 turbounits and 791 boiler units must be repaired. In order to carry out such an amount of repair work, the workers of the repair subdivisions, electric power stations, power systems and main administrations must apply maximum efforts, achieve a clear organization of repair work, increase discipline in the repair subdivisions, and direct basic efforts and material resources to repairs. These efforts and resources can be found in cases where the work can be done later. Special attention must be given to the repair of hot water boilers, mainline thermal pipes, the timely preparation of buildings and structures, and the repair of the equipment of the electric power networks.

In the Glavtsentrenergo, Glavuralenergo, Ukrainian SSR Minenergo, Kazakh SSR Minenergo and Zaglavenergo power systems there is a lag in the repair of equipment. This makes it difficult to observe the schedules for later repairs. The managers of all subelements must establish the required order in this matter.

At the Starobeshevskaya, Kurakhovskaya, Moldavskaya, Kashirskaya, Ir-iklinskaya, Uglegorskaya, Stavropol'skaya and Kirishskaya GRES's they have permitted the established repair schedules of some power units to be exceeded.

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We are also concerned about the fact that at several electric power stations - the Predneprovskaya, Zainskaya and Navoiyskaya GRES's - there have been repeated shutdowns of power units following repair work. This attests to the poor quality of the work performed during the repair campaign.

The Main Administration for the Production of Spare Parts and Repair of Electric Power Stations, the Main Administration of Material and Technical Supply and the Main Administration for the Outfitting of Electrical Equipment for Electric Power Stations, Substations and Networks must quickly within the shortest time period possible join with the republic-level subelements, main administrations and power systems determine what steps are needed to provide repair work with the required materials and spare parts.

All power systems need to step up measures to ensure the work that is connected with eliminating disruptions and production of power capacities, which were determined by a USSR Minenergo order of 16 January 1981, No. 3.

The timely introduction of power capacities, without which it is impossible to solve the task of fully preparing the power sector for winter or of successfully reaching the fall and winter maximum load, plays a key role in providing a power supply during the winter season.

The construction, installation and operational subelements are obligated to introduce new capacities: the Unified Power Grid of the Center - 3,615,000 kw; the Central Volga Unified Power Grid - 1,077,000 kw; the Urals Unified Power Grid - 345,000 kw; the Northwest Unified Power Grid - 1,935,000 kw; the Southern Unified Power Grid - 3,230,000 kw; the North Caucasus Unified Power Grid - 306,000 kw; the Caucasian Unified Power Grid - 300,000 kw; the Kazakh Unified Power Grid - 2,022,000 kw; the Siberian Unified Power Grid - 990,000 kw; the Central Asian Unified Power Grid - 1,582,000 kw; and the Eastern Unified Power Grid - 270,000 kw.

The Atomenergostroy construction of atomic electric power stations Association has a particularly important task in introducing power capacities at the AES's, which is connected with a serious improvement in the fuel balance and is very important in organizing a reliable power supply.

The introduction and assimilation of new power capacities is one of the most responsible and complicated tasks in preparing for winter; the solution of this task must come from the construction, installation and operational subelements. It is no less important that several crucial electric power network construction projects be put into operation.

For the individual regions the key tasks are: in the Center and Urals unified power grids - prior to December 1981 put into operation power capacities at the Kurskaya and Smolenskaya AES's, the Ryazanskaya and Surgutskaya GRES's; Mosenergo's TETs-25; eliminate capacity disruptions at Mosenergo's TETs-23, the Saratovskaya TETs-3, the Ivanovskaya

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TETs-3, the Saranskaya TETs-2, Penzenskaya TETs-1, Novocheboksarskaya TETs-3, Novo-Sterlitamaksyaya TETs, the TETs of the Volga Automobile Plant; the equipping and turning on of the 500 KV VL /power line/ from the Kostromskaya GRES to Vologda, the 500 KV VL approaches between Lipetsk and Balashov to the Novovoronezhskaya AES. For the output of the capacity of the Surgutskaya GRES it is necessary to build a 500 KV VL linking the Surgutskaya GRES - Dem'yanskaya and Surgutskaya GRES and Urengoy;

in the Southern Unified Power Grid - introduction of the first power units at the Southern Ukrainian AES, the Zuyevskaya GRES-2 and the Kievskaya TETs-6, power capacities at the Chernobyl'skaya and Rovenskaya AES; the creation of conditions for the steady operation at full capacity of all existing equipment and providing for the transfer of capacity for export and to the Center; the timely introduction of the 750 KV VL linking the Chernobyl'skaya AES and Vinnitsa and ensuring the output of full capacity from the Chernobyl'skaya AES;

in the Kazakh Unified Power Grid - the further construction of the Ekibastuzskaya GRES-1 and the introduction of the next power units with a capacity of 500,000 kw and the performance of work connected with the regular operation of this electric power station and the Yermakovskaya GRES;

in the Siberian Unified Power Grid special attention must be given to the timely elimination of capacity disruptions at the Irkutskaya TETs-11, the Omskaya TETs-4, the Tomskaya GRES-2, providing the regular operation of the Gusinozerskaya GRES. It is necessary to introduce the 640,000 kw capacity hydraulic turbogenerator unit of the Sayano-Shushenskaya GES and the 500 KV VL between Abakan and Itat for the output of the capacity of this GES;

in the Central Asian Unified Power Grid it is necessary to ensure the introduction of the second link of the 500 KV VL between the Nurekskaya GES and Regar prior to the fall and winter maximum load;

in the Eastern Unified Power Grid it is important to complete the construction of the 500 KV VL between Svobodnyy and Khabarovsk and Primorskaya and Dal'nevostochnaya as soon as possible.

The accumulation and economical use of hydroresources is an important task in preparing for the fall-winter maximum load.

The Central Dispatch Administration, the ODU /unified dispatch administration/ and all operational subelements, upon which depends the mode of the GES's operation, must provide the maximum preservation of water supplies in all of the basic reservoirs of the Volga, Kama and Dnepr rivers cascades, which will make it possible to more fully use the GES's capacities during the winter.

It is necessary to protect the water resources of the Baykal and Bratsk reservoirs. Hydroenergy occupies a significant percentage of what is needed to meet the needs for electric power in regions of Siberia. The Siberian ODU and Glavvostokenergo /Main Administration



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for the Exploitation of Power Systems of the East<sup>7</sup> are obliged to take steps for conserving water resources of the Angarsk and Yenisey cascade during the summer.

All operational subelements face especially important tasks in creating fuel supplies at all electric power stations. The realization of fuel and its timely unloading must constantly be in the center of attention of the primary managers of the electric power stations, power systems and main administrations. At all electric power stations it is necessary to provide for the maintenance of railroad tracks, rolling stock and equipment in fuel depots and fuel handling, defrosting equipment, their preparation for reliable operation in winter conditions, which will do away with excessive idle time of railroad cars and tank cars during unloading operations and interruptions in the feeding of fuel to the shops of the electric power stations. There are still many problems in solving this task.

A great deal of responsibility rests in the collectives, which provide the start up and assimilation of atomic power units at the Novovoronezhskaya, Southern Ukrainskaya, Smolenskaya, Kurskaya, Chernobyl'skaya, Rovenskaya and Kol'skaya AESs, for improving the fuel balance.

In 1980 the republic ministries, operational and production main administrations, the power administrations, and the power sales organizations did a great deal of work with the consumers in all branches of the national economy for conserving power resources. According to data of Gosenergonadzor /State Inspectorate for Power Engineering Control<sup>7</sup> the enterprises of industry, transport and construction in 1980 conserved more than 14 billion kilowatt-hours of electric power as compared with the relative norms. This shows the importance of the measures that are being performed. However, at many industrial enterprises in the sphere of domestic consumption there are still a great many non-production losses of power, which indicates that not enough work is being done to reduce the electric power expenditure norms. Frequently established limits of power consumption are exceeded; in some cases violators are not being prosecuted as they should. In conjunction with local organs and consumers it is necessary to strengthen efforts to find and eliminate shortcomings in the utilization of electric and thermal power, to eliminate non-production losses, to increase the responsibility of enterprises and organizations for the wasteful expenditure of power and for the violations of the modes of electric and thermal power consumption. It is very important to ensure that measures are taken to carry out the assignments in maintaining the level of compensation of reactive capacity and norms for the recycling of production condensate.

During the last fall-winter maximum load the power systems did a significant amount of work with the consumers in leveling the load schedules during the peak load hours of the power systems. Research performed by organs of Gosenergonadzor uncovered additional reserves for reducing the consumption during peak hours by more correctly observing the modes of operation of the technical and auxiliary equipment of the consumers. In concert with the consumers and local

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organs it is necessary to develop and implement additional regulatory measures and to ensure during the winter a reduction in the size of the 24-hour maximum loads of the power systems by not less than 2 to 3 percent.

The ministries and departments, managers of enterprises, organizations and institutions must direct their efforts and those of the labor collectives toward the thrifty utilization of fuel and power and the observation of the conservation mode in all links of production.

For all power systems and power associations a key task is to continue the struggle to further reduce the relative expenditures of fuel.

We must remember that reducing the expenditure of fuel for the production of electric power by one gram per kilowatt-hour yields nearly one million tons in fuel savings per year. For the 1981 the ministry has been given the assignment of reducing the relative expenditure of fuel for the thermal electric power stations as compared with 1980 by 1.1 gram per kilowatt-hour and to raise it to 326 grams per kilowatt-hour. This is a difficult assignment. During the past several months the relative expenditure has been reduced by only 1.1 gram per kilowatt-hour; this is quite disturbing and all power systems must do everything possible to ensure fulfillment of this key assignment.

There are quite a few good examples of work done in reducing the relative expenditures of fuel, including the following: the Kostromskaya, Konakovskaya, Reftinskaya and Shchekinskaya GRESs; Mosenergy, Saratov-energo, Permenergo, Khabarovskenergo. At the same time several power systems are not fulfilling this indicator, including: Chelyabenergo, Irkutskenergo, Mordovenergo, Penzaenergo, Saratovenergo, Buryatenergo, Novosibirskenergo, and Chitaenergo. Their indicators are even worse than last year's.

Analysis shows that in addition to the difficulties connected with deliveries of poor quality fuel in some cases and the overloading of inefficient equipment, there are instances where work modes are being violated, where there are excessive losses of heat in escaping gases, the mechanical incomplete burning of fuel, inadequate temperature of feed water and other shortcomings.

The main task in reducing the expenditure of fuel is to determine the complete set of organizational and technical measures to be taken for each power station and power system. We need to tighten up the mode charts for loading and operating the power units, to tighten control of equipment operation, and to eliminate the still significant delays in repairing efficient equipment.

We must trace the structure of electric power production. The Central Dispatch Administration of the Unified Power Grid of the USSR, the Unified Dispatch Administration, the electric power stations, the power systems, the operational main administrations must utilize all opportunities for optimizing the modes and the full loading of efficient power units and atomic electric power stations. A no less important

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condition, which can help to conserve fuel, is the fulfillment of measures for modernizing and updating equipment.

A very important section on the preparations for winter has to do with reducing the accident rate. Many electric power stations and power systems have done a great deal of work and have managed to increase the reliability of equipment operation and have improved their work with personnel. These include the Sredne-Ural'skaya, Ladyzhinskaya, Litovskaya, Lukoml'skaya GRESSs, TETs-21 and TETs-23 of Mosenergo, Lenenergo's TETs-7. At the same time during the last maximum load several electric power stations were not prepared for operations in winter conditions, but the managers of the power systems had issued documents stating that they were prepared. These documents were issued without justification to the Penzenskaya TETs-1, the Stavropol'skaya GRES, and the Lipetskaya thermal networks.

Several accidents, which took place in 1980, were connected with shortcomings in organizing the operation at electric power stations and in electric and thermal networks.

During the past months of 1981 there has been no substantial decrease in the accident rate for the ministry on the whole; there has been an increase in the accident rate within some power systems. The number of accidents increased significantly within Pavlodarenergo, Dal'energo, Tatenergo, Kuzbassenergo, Mosenergo, Kievenenergo, Lenenergo, Permenergo, Chelyabenergo, Ryazan'energo, and Volgogradenergo.

At some electric power stations accidents occurred due to lack of adherence to the rules governing the technical operation and the instructions; in other cases there were violations in the ways of handling the work modes of equipment and simply through personnel errors. Such things took place at the Mazheykskaya, Tyumenskaya TETs, and the Tbilisskaya and Zainskaya GRESSs.

The reliability of the operation of the Ekibastuzskaya GRES-1 is cause for serious concern. A key task for the Kazakh SSR Minenergo and its subelements, the managers of construction and installation subelements is to eliminate weak spots and to create the necessary conditions for the normal operation of the electric power station. Work experience of the Ekibastuzskaya GRES-1 must be carefully studied and taken into consideration in the planning, construction and operation of subsequent electric power stations within the Ekibastuz fuel and power complex.

Ensuring a reliable and accident-free operation of the power enterprises requires the systematic raising of the skills of personnel and ensuring the appropriate discipline and sense of responsibility of personnel. The concern of managers about creating the needed conditions in work is of considerable importance. They must also concern themselves about the living conditions and recreation of the workers and must ensure a favorable moral and psychological climate within the collectives.

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It is necessary to give added attention to checking the relay protection devices, the AChR /automatic frequency discharge/ and the automatic safety equipment, taking into consideration the impending operating modes of the electric power stations and the loading of the high voltage power transmission lines. It is necessary to check the status of the instructions and other documents having to do with organizing the operation of the power units and which determine the activities of the personnel in preventing accidents. It is also necessary to conduct the needed training sessions.

Serious attention must be given to questions having to do with raising the stability of the power systems' work on the whole, including the power associations. Attention must also be devoted to the equipping of the electrical networks and electric power stations with automatic safety equipment. It is particularly important that measures be taken in a timely manner in regard to automatic safety equipment. And steps must be taken to ensure the output of the capacity of the Chernobyl'skaya, Novovoronezhskaya and Smolenskaya AESs, the Ekibastuzskaya and Ryazanskaya GRESs and to ensure the reliability of their operation. It is also necessary to raise the reliability of the basic intersystem connections. The assignments of the Central Dispatch Administration of the Unified Power Grid of the USSR and the Unified Dispatch Administration for connecting the load of users to AChR and SAON devices.

In preparing the power enterprises and power systems for winter it is necessary to give attention to the qualitative performance of repair work not only of the basic equipment of the boilers and turbines, but all equipment of the power facilities - the GZU /lightning protector/ systems, water supply, and the fuel transport shops equipment, the KhVO, heating, ventilation of buildings and structures and the carrying out of safety measures, sanitary and domestic measures and work on other safety equipment.

A key question concerns the need to preserve the needs of the electric power stations in any difficult conditions. This important question does not always receive the needed attention.

In organizing the reliable power supply it is particularly important that discipline be maintained in ensuring the assigned dispatch schedules to the power enterprises and to observing the modes of power consumption.

This year it is necessary to do a significant amount of work to fulfill the order to raise the reliable supply of power to rural consumers.

All power systems and power enterprises are required to strictly observe assignments for transferring capacity and electric power between the power systems and associations of the Unified Power Grid. It is necessary to do everything possible to ensure power transfer assignments while preparing for winter.

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FUELS

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WHOLESALE OIL PRICES RAISED, MORE FREQUENT PRICE REVISIONS URGED

Moscow NEFTYANAYA PROMYSHLENNOST' SERIYA EKONOMIKA NEFTYANOY PROMYSHLENNOSTI in Russian No 7, 1981 pp 2-5

[Article by V. K. Vasil'yeva and N. N. Kosinov (VNIIOENG [All-Union Scientific-Research Institute for the Organization, Management and Economics of the Petroleum Industry]): "The New Schedule of Enterprise Wholesale Prices for Oil"]

[Text] The steps now being taken to further improve planning and to strengthen the influence of the economic mechanism on increasing production efficiency and work quality require constant improvement of the country's system of prices and price-setting.

The wholesale prices for oil and gas that are effective until 1 January 1982, which were formulated in 1967, are very much out of date. They reflect neither the changes that have occurred in development of the industry nor its structural shifts. The average enterprise wholesale price for oil has been kept at one level for more than 14 years, so in recent years (since 1975), it has been necessary each year to revise the price levels for the various associations in order to enable them to operate profitably. Many associations, by virtue of a degradation of technical and economic indicators, have stopped making income payments into the budget (since 1 January 1979 income payments for the industry have been completely abolished), and average interest for the use of capital has been reduced below the standard by more than 2 percent. The retention of a stable level of wholesale oil prices for the industry as a whole over such a lengthy period has not enabled reimbursement of the true expenditures for geological prospecting and exploration, which in recent years have tended to rise per estimated ton of crude. The profitability of many associations has fallen sharply and price has ceased to fulfill its motivational function of promoting growth of oil-production effectiveness. During this period a steady trend of shifting to the development of fields that have worse geological conditions from the standpoint of recovery has been noted. Aging of the fields that are producing, the necessity for introducing less productive fields into development, and the increasing remoteness of the oilfields and deepness of the productive formations have entailed growth in labor and material expenditures for recovering the crude.

During this period water encroachment and the share of mechanized recovery have increased, and specific expenditures on new capacity per ton of absolute growth in oil recovery have risen. The dynamics of the growth of these indicators has been directly reflected in the capital intensiveness and the prime costs of recovery, especially in the "old" oil regions.

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These trends in the industry's development will also occur over the long term, since many fields in the European part of the Union are in the concluding stages of development, and growth in oil recovery will occur mainly by the introduction of fields in the country's eastern regions into development.

Consequently, the problem of wholesale prices for crude came up a long time ago, and the question of reviewing them and improving the price-setting system itself has been posed more than once to the appropriate legislative organs.

Accordingly, schedules for wholesale prices for oil and gas were prepared which have now been approved and will go into effect 1 January 1982.

In developing the schedules of the wholesale oil price lists the main point was that the prices reflect the socially necessary labor expenditures more fully, and that other measures be taken which were aimed at achieving normal profitability and effectiveness of oil recovery. Work on the new price lists was oriented to further improving the whole system of setting prices for oil in a way that will make them most important tools for implementing the country's economic policy.

Wholesale-price planning should be based upon an analysis of actual development of the economics of the industry, taking into account long-term changes in its deployment and pace of development, the dynamics of production outlays, capital intensiveness, labor productivity and other factors. The determination of an economically valid level for wholesale prices becomes especially urgent in light of the CPSU Central Committee and USSR Council of Ministers decree of 12 July 1979, "On the Improvement of Planning and Strengthening of the Influence of the Economic Mechanism on Increasing Production Efficiency and Work Quality," which paid great attention to cost accounting and to strengthening the role of economic levers and incentives.

The decree aimed both at the economical use of material, labor and monetary resources and at a strict accounting for and monitoring of the funds spent. In this connection, the prime cost of the output, which is the basis for price, has a special role in forming the socially necessary expenditures (ONZT's) for labor and wholesale prices.

In order that prices may reflect socially necessary labor expenditures more fully, it is necessary to improve prime costing in the areas of refining the basic standard-practices principles and of making a more detailed accounting for all expenditures for producing the product, without, at the same time, allowing all kinds of nonproduction expenses and losses to be included in the prime cost or overstating consumption norms for material resources and labor expenditures. When the new wholesale price list schedules are put into use, the methodology for figuring prime costs for oil recovery also is changed. Thus, in order to reflect actual expenditures for social insurance more fully in the product's prime cost, interest on the deductions for these purposes will be raised, becoming 14 percent.

On 1 January 1982 payments for water consumption by industrial enterprises will be introduced for the first time. Payment for the diversion of water from water sources and for the discharge of unpurified or inadequately purified effluent into them will promote the rational use of water resources, the reproduction of which requires substantial expenditures by the national economy.

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Also being changed is the schedule of deductions for reimbursing the costs of geological prospecting and exploration. The new single per-ton rate of deductions for GRR [geological prospecting and exploration], which is double the current rate, calls for more complete reimbursement of expenditures for these purposes. However, studies indicate that the level of expenditures for prospecting and exploration per estimated ton of oil recovered during the 11th Five-Year Plan will exceed the approved rate of deductions. Some inconsistency in the contemplated expenditures for reimbursement thereof in the planned wholesale oil prices was occasioned by the general standard practice for setting prices, based upon expenditures during the base, preplan period. Such an approach may answer the requirements of machine-building, but it does not meet the needs for development of an extractive industry. One of the key factors in the price-setting problem was and is the question of profit, the role of which rises especially at present, in light of the tasks for improving the economic mechanism that were noted above.

Profit in the prices of products is economically justified because it enables enterprises to function on the basis of cost-accounting principles. So the minimal profit-level limit should be determined by the magnitude of payments made into the budget in accordance with the established standards and the magnitude of the economic incentive funds. Justification for profitability in the prices of a product involves a consideration of the specific conditions for production, primarily the ratios of current outlays and the cost of production capital. It should be noted that the approach to the formation of profit within prices has not been identical for the various stages of development of the socialist economy. Thus, during the period preceding the overall review of prices (1967), the level of profit within price was established in minimal amounts relative to the prime cost of the product.

This principle was adopted mainly as an incentive for enterprises to reduce production outlays. Profitability is now figured in relation to production capital, the more effective use of which is a task of no little importance for developing the national economy. Such an approach to the establishment of profitability presupposes that prices take the capital intensiveness of output into account. Payment for productive capital becomes a mandatory element of price. These changes in the principles of forming profit were reflected also when the system of prices for the oil industry was devised.

The profit level for oil in the new prices that are being introduced 1 January 1982 was set on the basis of a planned increase. This amount of profit will, in accordance with the requirements for price-setting, allow actuation in the nearest future of all the cost-accounting levers of the economic mechanism for the industry's functioning, that is, restoration of the income payments system, the introduction of payments into the budget for the use of capital in accordance with established standards, the forming of economic incentive funds (the material incentive fund, the fund for the construction of facilities for social, cultural and personal-amenity purposes, and the production-development fund), and the reimbursement of other plan expenditures.

Experience indicates that the price structure for oil must include such an economic regulator as income payments if normal cost-accounting conditions are to be created for the operation of all the industry's associations.

In the oil industry, the problem of differential income arose in its practical aspects at the time of the price reform of 1967, when wholesale prices for oil were

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more than doubled. As is known, the wholesale oil prices that were in effect prior to the 1967 reform did not include income payments, and their role was, in essence, filled by the turnover tax on oil-product prices. Thus the differential income created thereby directly during oil recovery was realized through the prices of other commodities--petroleum product.

The problem of setting apart the differential income that has been formed from the remaining portion of the profit, so that it will become an element independent of it, was solved by introducing income payments in the oil industry. In this case there is a potential for eliminating the influence of natural factors on an enterprise's production activity. In so doing, the task should be performed in such a way that removal of the income payments will not be reflected in the level of accounting profit, the more so since the latter is the source for forming economic incentive funds.

It should be noted that the level of differential income depends directly upon how the principle under which one price or another has been formulated. Thus, while it would be possible in oil recovery to establish a single price for oil on the basis of the expenditures of the associations that were operating under the worst conditions, the level of the income payments schedule would be determined by the difference between the expenditures of these associations and of those that are carrying out their activity under more favorable conditions.

Because, beginning 1 January 1982, there is to be a limited rise in the average level of wholesale prices paid to enterprises for oil, zonal prices were worked out, within the framework of which income payments were determined. Three pricing zones have been formed and, accordingly, three price levels, in which the schedule of income payments has been set to take into account production outlays and the capital intensiveness of oil recovery, which are tentatively being called "adduced expenditures." In each pricing zone, no income payments are planned for associations with the highest adduced expenditures. A "rebirth" of the system of income payments and the introduction of the new schedule of enterprise wholesale oil prices will enable normal cost-accounting activity to be executed by those associations at which growth in expenditures for oil recovery is anticipated during the plan period. As changes occur in the dynamics of prime cost and capital intensiveness for the various associations, an annual adjustment of schedules for income payments is recommended, with a view to preserving normal cost-accounting conditions for their operation and to creating a potential for forming the necessary accounting profit. In addition to income payments, such an element of price as payment for the use of capital exerts a definite influence on the amount of accounting profit. This most important economic tool of management was intended to increase the utilization effectiveness of capital, and it reflects actual production conditions.

As a result of the changes in the siting of oil recovery that have taken shape, the centers for oil-industry development are moving to regions with difficult natural and geographical conditions, where the capital investment level is severalfold higher than in old oil regions. Moreover, growth in capital investment even in the "old" oil regions is inevitable by virtue of the need to increase drilling in order to maintain the level of oil recovery.

In its turn, growth in capital investment causes a corresponding rise in the cost of industrial-production funds and, consequently, in the capital intensiveness of



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oil recovery. Substantial fluctuations in capital intensiveness among the various associations are observed here. Further growth in the capital intensiveness of oil recovery has necessitated a rise in the share of payment for the use of productive capital per rated unit of output in the new prices for oil, and it was also one of the main causes of growth in the prime cost of oil recovery, along with the drop in flow from the wells.

Payment for the use of production capital in the schedule for the new wholesale prices was calculated in accordance with the standards adopted for the oil industry--11 percent of the residual cost for oil wells, and 6 percent of the initial cost for other items. Introducing payment for the use of production capital into the budget in full measure, in accordance with the established standards, will exert a positive influence on the strengthening of cost accounting.

Thus, a distinguishing feature of the new wholesale oil prices, compared with existing prices, is the fact that they support adequately the action of all the cost-accounting levers of the economic mechanism for the industry's functioning in the future.

The experience of past years indicated that the period for preserving a stable price level in some branches of industry should have definite limits. In regard to the extractive industries, where sharp changes in production conditions take place, the five-year plan can be the optimal period. Beyond this period, price ceases to fulfill its inherent motivational function and remains only an accounting category.

Theoretically, the desirability of precisely this effect of wholesale price lists on extractive-industry output, but for no longer a period, has been generally recognized. However, in practice the periods for review are stretched out unjustifiably for extremely long time periods. The consequences from such a lengthy period of keeping price lists in effect were indicated above.

Since the middle of the 1970's the question has repeatedly been posed of the necessity for a most accelerated revision upwards of wholesale prices for oil. During that time it was recommended that the average wholesale oil price paid to enterprises be greatly raised. However, review of the drafts of the new price lists was stretched out. Even the prices to be introduced on 1 January 1982 have some defects. So the effective period of the new price lists for oil should be restricted to the 11th Five-Year Plan period, in order that these prices will not become a brake on development of the industry's economics. An average oil-price level prescribed by directives for the industry beyond such a period will not enable cost accounting to be conducted at many oil-recovery associations. This relates primarily to the fact that most associations will not have the funds even to make payments into the budget for the use of production capital in accordance with the full standards, not to mention the income payments. Under such conditions prices lose their motivating function, and in this case the potential for a leveling out of the natural factor for equalizing conditions for the economic activity of associations will be exhausted.

Therefore, work to further improve the system for setting oil prices within the industry should be continued, primarily in the area of economic substantiation of the oil-price level beyond the 11th Five-Year Plan. One of the possible ways for resolving this task is to establish a correct ratio of prices to the output of various branches of the national economy through a redistribution of profit.

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Within the framework of this task, questions of strengthening the incentive effect of price (and of its various elements) on raising oil-production effectiveness also need further study.

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FUELS

IMPROVED TRANSPORTATION SYSTEMS NEEDED FOR TYUMEN

Moscow NEFTYANAYA PROMYSHLENNOST' SERIYA NEFTEPROMYSLOVOYE STROITEL'STVO in Russian No 8, 1981 pp 16-18

[Article by V.A. Vasilyuk: "The Economic Problems of Improving Transportation Services For the Tyumen' Petroleum and Gas Extracting Region"]

[Text] Transportation availability is one of the basic factors in the development of the petroleum and gas extracting areas of Tyumenskaya Oblast. At the present time the extracting industry of the Middle Priob'ye is shifting to the north and natural-climatic and economic-geographic conditions are changing. The lake and swamp density of these territories comes to 80 percent. The new deposits have different geological characteristics which make the process of drilling difficult and reduce productivity and the average yield of each new well compared to the Middle Priob'ye. As a result of this, the volume of freight being supplied for drilling has been increasing substantially. The transportation system which serves the petroleum and gas extracting industry of the Tyumen' North includes railroad, river, maritime, motor vehicle, and air transport. All of the mainlines are isolated and removed from one another by 200-500 kilometers.

The geographic location and length of the existing railroad network does not fully meet the needs of the areas extracting hydrocarbon raw materials. New railroad lines which would ensure the delivery of freight without excessive transshipments are needed. Practice shows that when freight is delivered by mixed transportation methods the cost of the hauls is lowered, but the expenditures for loading and unloading operations increase substantially. In addition, with fivefold transshipments 15-20 percent of the freight is ruined while in route. The Main Administration for Petroleum and Gas in Tyumenskaya Oblast brings in 98 percent of its material and technical resources by railroad, and of this amount, only 40 percent directly into the petroleum extracting areas, and the other 60 percent is transferred onto river vessels and delivered to the bases of associations in the extraction areas. Then some of the freight is transferred to small ships and delivered to the deposits on small rivers, some of the freight is taken to the deposits by motor vehicle transport, and the rest is kept at the bases until the onset of winter and the beginning of the operation of winter roads. The winter roads are used for delivering as much as 700,000 tons of freight to the deposits. The development of the railroad network and an increase in the amount of freight deliveries by the Northern Sea Route has not decreased the role of river transport. The rivers of the Ob'-Irtysk basin continue to be chief waterways. Within Tyumenskaya Oblast the navigable river sys-

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tem includes the rivers Ob', Irtysh, Tura, Tobol, Agan, Vakh, Lyamin, and also Pur, Taz, and Nadym. In the latitudinal current of the Ob' the river fleet performs hauls 160-190 days, and at the more northern small rivers and the Nizhnyaya Ob'--from 120 to 80-30 days.

Motor vehicle transportation performs most of the freight hauls in the petroleum and gas extracting areas. The relationship between interfield and intrafield motor roads with basic servicing is 2:1. On the average, there are 4.5 units of motor vehicle-tractor equipment per kilometer of motor vehicle roads with basic servicing in the Tyumen' North. The increase in the need for such equipment is connected with the constantly increased difficulties in developing new deposits. In the future the need for this equipment will increase.

The experience connected with developing the deposits of the Tyumen' petroleum and gas extracting region has demonstrated the necessity for an overall approach to improving the transportation system. Different types of transportation are used in internal and external freight hauls, sometimes without regard to economic expediency. In the development of new deposits intra-area and inter-field freight hauls will be performed at the level of 80 percent by motor vehicle transport, and the rest by helicopters (more rarely, airplanes). At the present time the lowest cost for freight hauls is on river transport, and the highest on railroads. Most of the freight is brought to the Tyumen' North by river transport during the navigation period whose length is around five months in the north Priob'ye, and not more than four months in the Far North. As a result of the seasonal operation of river transport it is necessary to equip bases for the storing of material and technical resources, which leads to a substantial "freezing" of resources.

In recent years the freight turnover of the riverports has been increasing annually and, for this reason, a large part of the freight is delivered through southern ports with a large overrun, which with the short navigation period reduces the indicators of fleet use.

The experience in operating one of the railroads in this area during 1975-1980 shows a decrease in transportation expenditures in petroleum field construction. However, at the same time, on account of an insufficiently developed network of inter-field motor vehicle roads with hard cover, which holds back the work of the motor vehicle pool, the share of transportation expenditures increases. The overall tendency in a change of transportation expenditures and the additional expenditures connected with them can also be traced in analysis of the expenditures related to one million rubles of construction and installation work. To a substantial degree an improvement of railroad and motor vehicle freight flows will be promoted by an expansion of the network of rail and motor roads. New lines will ensure supply for the petroleum and gas extracting industry and for construction subdivisions. However, to develop a system of motor vehicle roads in the Priopolyar'ye on the basis of increasing the length of dirt-log roads and winter roads is economically inexpedient. It is essential to have a scientifically substantiated technology for the construction of inexpensive and reliable motor vehicle roads. Otherwise, it would be expedient to build railroad lines. Let us examine an example. The amount of earth work in making an embankment for motor vehicle and railroads at a given latitude is the same, and the upper part of the construc-

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tion of a motor vehicle road in its amount of cost is more and its operational periods are shorter than a railroad. With a minimum width of the motor vehicle road of six meters per kilometer it is necessary to have 850 cubic meters of ferroconcrete plates, and on the rail base with a width of two meters (replacing the ballast and ties with ferroconcrete plates or frames)-200 cubic meters. When freight intensity falls off the rails and the under-rail foundation can be used repeatedly on newly built inter-field lines, while the motor vehicle road plates quickly become unserviceable as a result of active cryogen processes.<sup>1</sup> At this latitude the valley river complexes have sands, pebbles, and sandy loam; the water divide sectors are more frequently represented by sandy loams, loams, and clays. Since the vegetation and soil strata are of negligible strength, dirt can be taken by the open method for the earthen right-of-way; in zones where thawed ground is widespread hydromechanization is used. The forced development of the transportation system is the result of the tendency for construction industry enterprises to move near to the sites of industrial and housing construction.

It would be useful to create enterprises for the production of road cover plates involving the thermal processing of ferroconcrete products. Local small grade sand is used to prepare heavy concrete; one cubic meter of mass for 2.4 tons of products. The on-site production of road cover plates will make it possible to decrease the cost of road surfacing by 50 percent. However, the problem of intra-area freight hauls and of the thoroughfare importation of freight cannot be solved solely through the construction of inter-field roads and railroads. It is clear that in the North river transport will preserve its leading place for a long time, while urgent freight will be delivered from the bases to deposits by aviation.

In the development of the most remote petroleum deposits the basic freight will be delivered by motor vehicle transport on winter roads, while during the warm time of the year this will be done by aviation (helicopters). The MI-8 and MI-6 helicopters are the basic ones in the petroleum extracting areas. In order to improve the transportation network in the North it is necessary first of all to solve the problems of the siting and construction of support railroads, and also of railroad branches to individual deposits, railroad sidings, dead ends, and areas; and to determine the economic and geographic rationality of siting a network of motor vehicle inter-field roads with hard-top surfacing. This will make it possible to decrease the river freight flow and, consequently, the additional construction of storage bases, and also hauls on winter roads. It is also necessary to substantially decrease the use of expensive air transport for inter-field communications.<sup>2</sup>

The chief task of the development of the transportation system is to provide the necessary material and technical resources for areas where petroleum and gas deposits are being developed. It is advisable to create a support transportation network in an area out of railroad lines and hard-top motor vehicle roads. This will make it possible to decrease the adduced expenditures per ton of freight by ten times compared to the supply system which has developed.

In order to increase the capacity of permanent railroads it is necessary to build sidings and loading and unloading areas and to raise the level of the mechanization of loading and unloading work.

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The successful work of river transport in petroleum and gas extracting areas needs an improvement of the condition of piers, an expansion of the sphere of river transport on small rivers by means of lengthening, an increase in the transshipment capacities of ports, and the construction of new and expansion of existing take-off and landing strips at a number of deposits. A further increase in petroleum and gas extraction in the Tyumen' region depends upon the correct solution of the problems of improving the transportation system.

FOOTNOTES

1. A.V. Gruzlov, "Neslivayushchiyesya merzlotnyye porody v pripolyarnykh rayonakh Zapadnoy Sibiri," "Prirodnyye Usloviya Zapadnoy Sibiri," No. 7, MGU, Moscow, 1980.
2. I.D. Karyagin and V.S. Bulatov, "Razvitiye gazovoy promyshlennosti Severa Tyumenskaya Oblast, " Moscow, "Nedra," 1979.

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